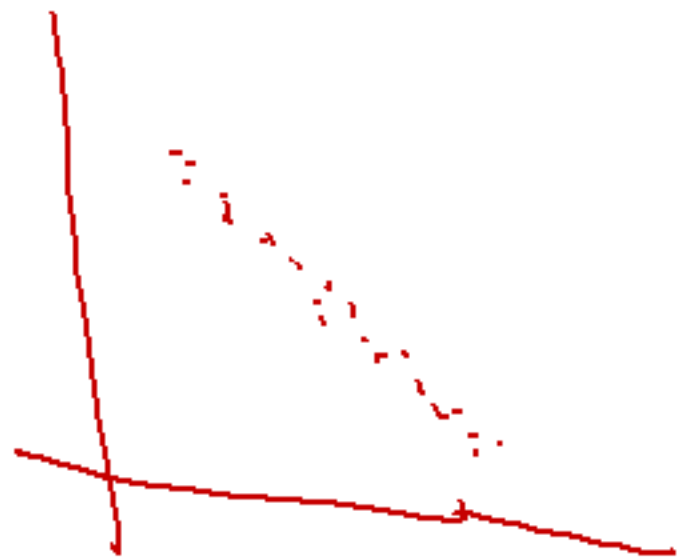


Association = when $x \neq y$ are related
(+ or -)

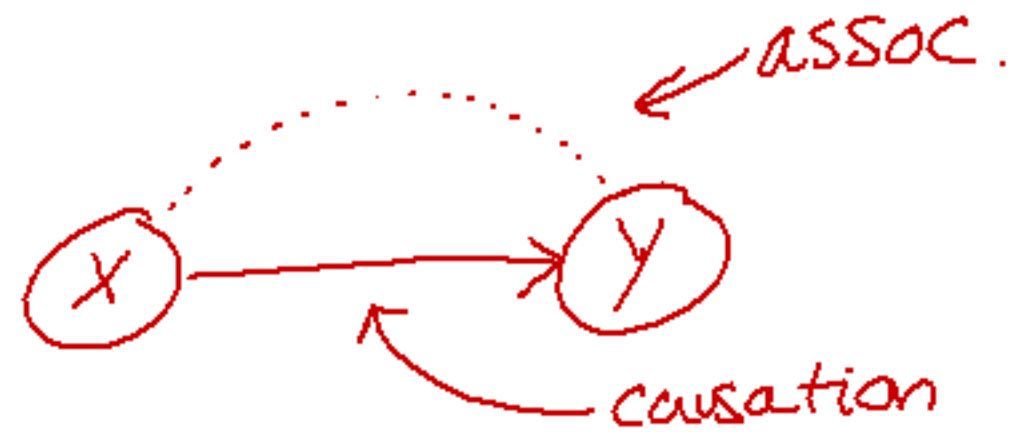
Causation = when x changing causes
 y to change.

assoc. \neq causation



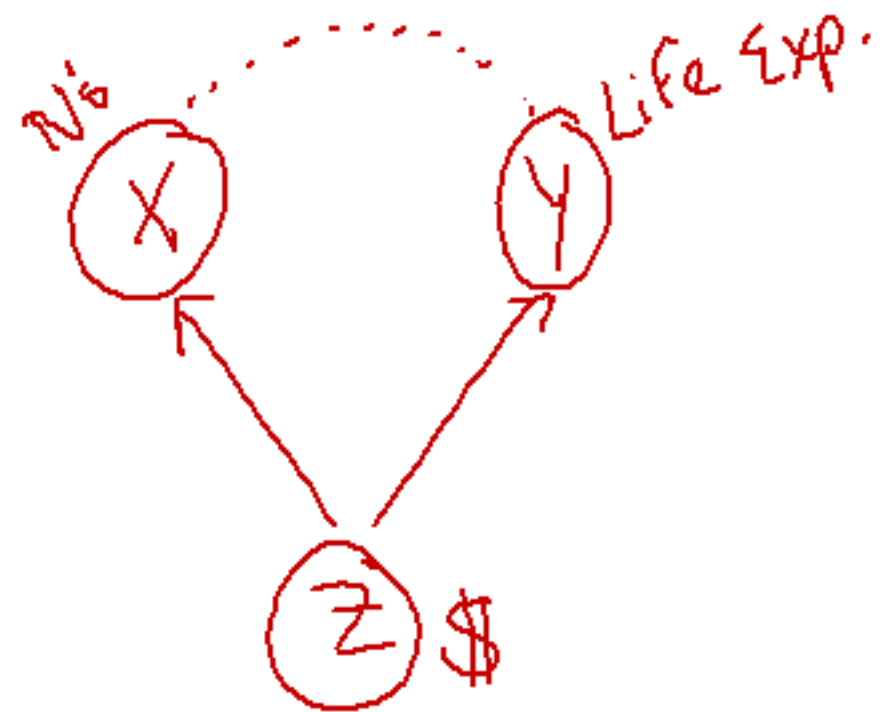
① Causation

X causes Y



② Common Resp.

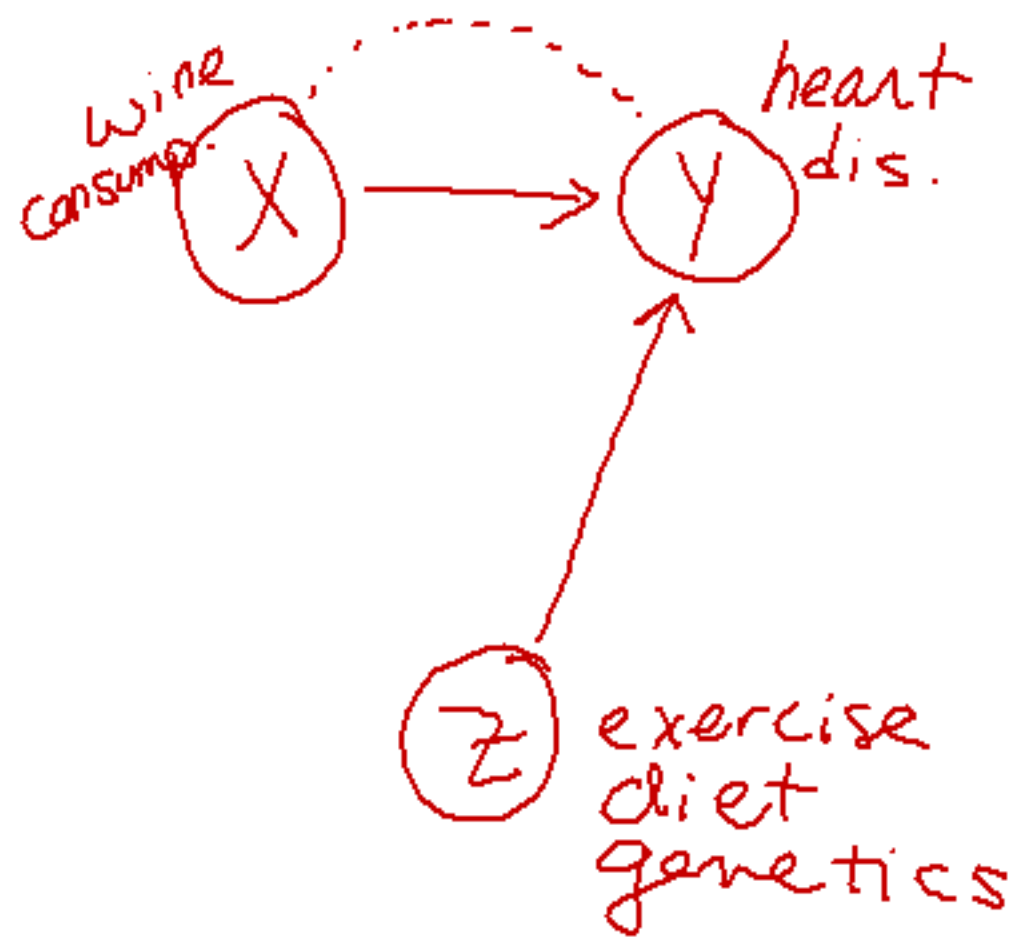
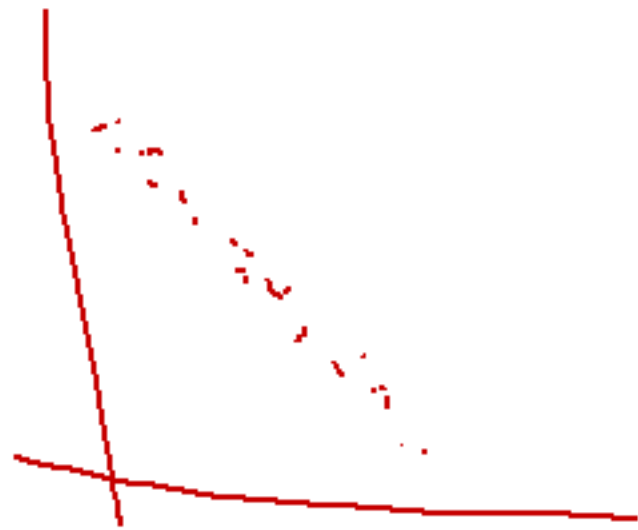
the assoc. btw. X and Y is explained by a lurking variable (Z).



Ex: TV's & life expect.

③ Confounding

Two variables are confounded when their effects on a response variable can't be separated



Ex: wine consump. vs.
heart disease

Establish causation?

* carefully designed expt.

* look for clues/evid.

- assoc. is strong (high r and r^2)
- assoc. is consistent (in many trials)
- higher doses \Rightarrow stronger responses
- alleged cause is plausible.
- alleged cause precedes effect in time.